

Mind the Neighbors

The Impact of Productivity and Location on Firm Turnover

Mary Hallward-Driemeier

Fraser Thompson

The World Bank
Development Research Group
Macroeconomics and Growth Team
October 2009



Abstract

This paper examines the impact of firm productivity and local industrial structure on firm entry and exit in Morocco between 1985 and 2001. There is strong evidence of productivity exerting a market-cleansing role. Less productive firms are found to be more likely to exit—and locations with more productive firms attract higher rates of new firm entry. The effect of productivity operates not only in an absolute sense; a firm's relative productivity or distance to the local sector frontier matters too. First, large productivity gaps are associated with higher rates of exit, while new firms are attracted to locations with small productivity gaps. Second, local competition increases the probability of exit, although

it does not encourage entry. Third, there is evidence of scale or agglomeration effects that increase firm turnover. Fourth, measures of sector diversity are not associated with lower turnover. Fifth, the geographic level at which agglomeration and competition effects are defined matters differently for exit than entry. For exit, the provincial measures are strong, while those for communes are weaker. For entry, it is the local productivity at the commune level that is more significant. This implies that competitive pressures are less geographically constrained while the potential benefits of agglomeration and spillovers are indeed more local.

This paper—a product of the Macroeconomics and Growth Team, Development Research Group—is part of a larger effort in the department to explore firm dynamics and the microeconomics of growth. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at mhallward@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

Mind the Neighbors: The Impact of Productivity and Location on Firm Turnover

Mary Hallward-Driemeier and Fraser Thompson*

Keywords: Externalities; Market Structure and Firm Performance; Regional Economic Activity.

JEL Classifications: D62, L10, R11.

* Mary Hallward-Driemeier is from the World Bank; Fraser Thompson is from the Oxford University Centre for the Study of African Economies. The corresponding author is Mary Hallward-Driemeier (mhallward@worldbank.org). We like to thank Sergio Kurlat for excellent data analysis and Taye Mengistae and Luis Servén for helpful comments. All opinions expressed in the paper are only those of the authors and do not necessarily represent the views of the World Bank or its Executive Directors. The other usual caveats apply.

1. Introduction

Understanding the determinants of firm turnover has become of increasing interest to policymakers as they have come to recognize both its important direct effects on the composition of surviving firms, as well as its indirect effects operating through the changes it brings about on the local economic environment in which firms operate. There is now considerable evidence as to the effect of various firm-level and some industry-level variables on firm productivity, however, much less is known about the effect of the local economic environment on firm entry and exit. This paper attempts to address this gap in the received literature using sub-national data on Moroccan manufacturing firms from 1985-2001.¹

Explorations of regional variations in economic performance and wealth have placed considerable importance on the role of agglomeration externalities. Loosely defined as the effects of the local industrial structure on firms, agglomeration externalities are thought of as providing a possible explanation for the tendency of economic activity to concentrate in small pockets of the world. Given that businesses generally face high wage and rental costs in these highly congested regions, this suggests that firms derive substantial benefits from the local industrial structure that compensate for these additional costs. The empirical literature on the effects of agglomeration externalities on various measures of firm performance is well established,² however, there relatively little evidence on the effects of these externalities on firm entry and exit. Given that agglomeration externalities are generally assumed to operate through

¹ Fraser Thompson thanks Marcel Fafchamps for making the data available for his dissertation and related work.

² See Rosenthal and Strange (2004) for a review of the recent empirical and theoretical literature.

productivity effects, this paper will also examine whether the agglomeration externalities influence firm turnover after controlling for productivity.

Three different measures of industrial structure or agglomeration are used in the paper. The first measures scale, the extent of activity in an area. It is measured by either the total employment in a location or the sector's share of employment in a location. Benefits could accrue from forward or backward linkages, thicker labor markets or improved access to infrastructure (Hirschman 1958, Fujita, Krugman and Venables 1999). A second measure is of sectoral diversity within a location. This captures the potential for spillovers from having different types of businesses in a location and the potential to borrow ideas from each other (Jacobs 1984, Henderson 1997, Combes 2000). A final set of measures capture the extent of competition, either by the concentration of activities across firms or by the number of firms in a location-sector (Glaeser et al. 1992).

The inclusion of a productivity measure in firm exit analysis is fairly standard in the literature, but the results have been somewhat mixed in developing countries. While Gebreeyesus (2005) and Shiferaw (2006) find firm productivity to have the expected negative effect on firm exit for Ethiopian firms, and Frazer (2005) finds a similar result for Ghanaian firms, Harding et al. (2006) find productivity to only impact on the exit decisions of larger firms. It is possible that simple productivity measures are failing to capture the whole story of efficiency on firm dynamics. Perhaps it is not just absolute efficiency (captured by these productivity variables) that matters, but also relative efficiency. In particular, as far as firm exit is concerned, it could be that it is not sufficient for firms to be simply productive in order to survive; they must also match the efficiency levels of those in their local region and/or sector. By linking these efficiency

requirements to the local market, this suggests that agglomeration externalities may operate through both the effects of the local industrial structure as well as through the relatively efficiency levels in the local region.

The contribution of this paper is five-fold. First, we extend the extant literature on the effects of the local industrial structure by considering its influence on both entry and exit, including measures of scale, diversity and competition to examine how location effects influence turnover. Second, we explore the influence of productivity on firm turnover not just in levels, but in terms of efficiency relative to the local frontier. Third, with a panel dataset, these estimates can control for unobserved firm heterogeneity, such as management quality, that might otherwise bias the estimates. The inclusion of fixed effects not only improves the measures of productivity, it also has implications for the measures of industrial structure. Any geographic or time invariant feature of location is also controlled for, making it easier to attribute the results to differences in the industrial structure and not to other dimensions of location. Fourth, we explore what the appropriate level of aggregation, whether it is at the provincial level or the commune level. Lastly, we test whether the productivity and agglomeration effects differ across firm characteristics.

Overall, we do find that agglomeration externalities influence firm turnover, even after controlling for firm productivity. While larger markets are associated with higher firm turnover, larger local-sector shares serve to raise exit probabilities, while lowering firm entry rates. This dynamic would have the effect of reducing the concentration of sectors over time. The effects of competition are similar, raising exit rates but discouraging entry. While more productive firms are found to be less likely to exit, a

firm's distance to the local technology frontier also matters. In terms of firm entry, firms seem to be attracted to regions with high average productivity and a smaller dispersion of productivity levels – and this matters more when the geographic unit is defined more narrowly.

The structure of the paper is as follows. The empirical framework used in the paper is outlined in the next section. Details of the variables included in the analysis and a discussion of the dataset is provided in Section 3. The results on firm exit and firm entry using data measured at the two geographical levels are reported in Sections 4, 5, and 6. Finally, we conclude in Section 7 with a summary of the findings.

2. *Empirical Framework*

2.1 The Entry and Exit Decisions

In this section, we develop a simple theoretical framework to guide the subsequent empirical analysis and to provide some testable hypotheses. The model of Hopenhayn (1992) provides a useful starting point. In this model, firm productivity levels evolve according to an exogenous Markov process, with new firms entering when the distribution from which they draw their initial productivity level implies that expected future profits will cover the sunk costs of entry.

Thus, firms will enter when their expected profits exceed this threshold level:

$$\Pr (Firm\ Entry_{n,t}) = \sum_{t=1}^{t=t^*} \frac{E(\pi_{nt})}{(1 + r_{nt})^t} - \theta_s > 0 \quad (1)$$

Where the subscripts n , s and t refer to the firm, sector and time period respectively ($t=1$ when the firm first enters the market, and $t=t^*$ when the firm expects to leave the market, with t^* endogenous to expected future discounted profits); π refers to profits; r is the discount rate (assumed to be specific to each firm); and θ is the sunk cost of entry (which is assumed to vary by sector s).

The exit decision differs in two ways from the entry decision. First, there is no additional sunk cost to consider in the decision-making process given that the firm will have already incurred this cost upon entering the industry.³ However, having incurred the cost and to avoid having to repay it should it re-enter, it could be optimal to delay responses to negative shocks. Second, the firm has current-period profitability information to inform its forecast of future profitability. Thus, the exit decision will depend on:

$$\Pr(\text{Firm Exit}_{n,t+1}) = \sum_{t+1}^{t=t^*} \frac{E(\pi_{nt}|\pi_{nt_0})}{(1+r_{nt})^t} > 0 \quad (2)$$

2.2 *The Role of Agglomeration Externalities on Entry and Exit*

A key variable of interest in both the firm entry and exit decision-making process is the expected future firm profits.⁴ We assume that firms base their estimation of these future profits upon the information available the period before entry or exit takes place. Obviously some of this information will contain transitory elements (e.g. random

³ Firms could face some sunk costs if they shifted locations or sectors. In this dataset, if firms do relocate, it is counted as an exit and entry, with the sunk cost of the new facility considered for the new plant. If firms shift sectors, that is not counted as an exit. With multiple product production facilities, the change in reported sector could simply reflect a relative shift across production rather than a larger change in production facilities.

⁴ There is also evidence on developing countries suggests that other elements of the business environment can affect the feasibility of entry, possibly by affecting future profits but also by restricting which entrepreneurs have access to which markets (e.g. World Bank 2004, Bigsten and Soderbom, 2005, Hallward-Driemeier 2009).

productivity shocks) that will not have any predictive ability of future profits, while the other component will contain elements that are likely to persist in the future (i.e. non-transitory) and hence be useful in forecasting future returns. The firm entry and exit equations can thus be transformed to:

$$\Pr(\text{Firm Entry}_{n,t+1}) = f(\tilde{E}(\pi_{Fnt}); \theta_s) \quad (3)$$

$$\Pr(\text{Firm Exit}_{n,t+1}) = f(E(\pi_{Fnt} | \pi_{n,t_0})) \quad (4)$$

Where $\tilde{E}(\pi_{Fnt})$ and $E(\pi_{Fnt})$ are the firm's expectations of its persistent profitability used to inform its entry and exit decisions (respectively) in period t+1. The key difference between the future profit expectations for firms considering exit or entry (i.e. $\tilde{E}(\pi_{Fnt})$ and $E(\pi_{Fnt})$) is the information set available at time t to generate these forecasts. Firms currently operating in the market will be able to have access to both market information and firm-level information to inform their exit decisions; whereas firms considering entry must base their entry decisions solely on market conditions prevailing at time t.⁵ The expected future profitability of entering and exiting firms is assumed to be determined as follows:

$$\tilde{E}(\pi_{Fnt}) = f(\tilde{Z}_n; \chi_s; \phi_i) \quad (5)$$

$$E(\pi_{Fnt}) = f(\delta_n; \delta_{nt}; Z_{nt}; \chi_s; \phi_i) \quad (6)$$

In equation (5), the expected persistent profitability component for a firm considering entry is determined by time-varying agglomeration variables (\tilde{Z}_n); and sector (χ_s) and

⁵ Entering firms are also likely to have information about the quality of their business proposition that will inform their entry decision. Given that this cannot be easily captured in the empirical testing, we abstract from this concern by assuming that firms enter the market without knowing their given "type" ex ante. This is similar to the assumptions of the Jovanovic (1982) passive learning model.

location (ϕ_i) fixed effects (where the subscript i refers to a given location). In contrast, the expected future profitability for firms considering exit is determined by agglomeration variables (Z_{nt})⁶ and the location and sector fixed effects, as well as firm-level characteristics which may be either fixed (δ_n) or time-varying (δ_{nt}).

Agglomeration externalities, thought of as the effects of the local industrial structure (e.g. specialization, diversity and competition) can potentially affect profit levels and hence decisions to enter and exit through multiple channels. The theoretical literature (e.g. Rosenthal and Strange, 2004) stress the influence of agglomeration externalities on productivity. However, it is equally clear that agglomeration externalities can influence firm-level prices through local competition effects (e.g. Salop, 1979); as well as the cost of intermediate inputs (e.g. Ciccone and Matsuyama, 1996; Rodriguez-Clare, 1996); and wages (e.g. Nickell, 1999; Hamilton, Thisse and Zenou, 2000).

As discussed above, being productive may be a necessary but not necessarily sufficient condition for firm survival. It may be that firms also have to be productive relative to firms in their same sector or region. If we think of productivity in terms of product innovation, this could imply that firms that are relatively more productive (in the local region or sector) are able to charge higher prices and hence earn higher profits.

As indicated in equations (7) and (8), the set of agglomeration variables influencing the firm exit and entry decisions differs somewhat:

$$\tilde{Z}_{nt} = f(C_{ist}; S_{ist}; D_{it}; P_{ist}) \quad (7)$$

$$Z_{nt} = f(C_{nt}; S_{ist}; D_{it}; P_{nt}) \quad (8)$$

⁶ The set of agglomeration variables used in the firm entry and exit regressions differs somewhat and is explained later in this section.

Where C refers to local competition externalities (which may vary across firms (n) and time (t) in the exit regressions, but only across location (i), sector (s) and time (t) for the entry regressions); S_{ist} refers to industrial specialization externalities (which are assumed to vary across location, sector and time); D_{it} refers to diversity externalities (which are assumed to vary across location and time); and P refers to relative productivity effects (which are calculated at the firm-level in the exit regressions and at the location-sector level for the entry regressions).⁷

Combining equations implies:

$$\Pr(Firm\ Entry_{n,t+1}) = f(C_{ist}; S_{ist}; D_{it}; P_{ist}; \chi_s; \phi_i; \theta_s) \quad (9)$$

$$\Pr(Firm\ Exit_{n,t+1}) = f(\delta_n; \delta_{nt}; C_{nt}; S_{ist}; D_{it}; P_{nt}; \chi_s; \phi_i) \quad (10)$$

Determining the direction of the effect of the competition, specialization and diversity effects is somewhat difficult given the multitude of channels (described earlier) by which these externalities can potentially operate. The relative productivity measure for the exit regression (equation 10) however leads to clearer testable hypotheses. A firm that is more productive relative to other firms in the local region could be expected to be able to charge higher prices, earn larger profits, and hence be more likely to stay in operation (or enter the market).

In the next section, we discuss the data and how this simple theoretical framework can be transformed into an empirical test.

⁷ The construction of this variable will be discussed in the next section.

3. Data and Variable Construction

3.1 The Dataset

The dataset used in this analysis is a census of manufacturers conducted annually by the Moroccan Ministry of Industry, Commerce and Productivity (formerly the Ministry of Industry and Telecommunications) from 1985-2001. The survey provides information for approximately 90% of firms operating in the manufacturing sector.⁸ Components of this dataset have been used by Haddad (1993), Haddad and Harrison (1993), Haddad, de Melo and Horton (1996), Harrison (1996), Currie and Harrison (1997), Clerides, Lach and Tybout (1998) and Fafchamps, El Hamine and Zeufack (2002) to explore questions related to trade liberalization, foreign direct investment, exporting and/or productivity; and by Bun and El Makhoulfi (2004), Fafchamps and El Hamine (2004), Fafchamps (2004) and Mengistae and Thompson (2006) to study sub-national location effects.

This data set has several advantages. First, it is a census dataset that is carried out every year. Second, it does not have a floor or minimize size threshold for respondents to be included. Having a threshold (e.g. of 10 or 20 employees) would make it almost impossible to distinguish true exiting firms from those whose employment has slipped below the cut-off but who remain in operations. Likewise the measures of entry are cleaner and do not reflect a period (potentially of years) when firms operated, but below

⁸ Only very small or informal firms are not captured by the sample. The coverage of medium and large enterprises is virtually universal. The Ministry of Industry, Commerce and Productivity imputes values for all non-responding firms, usually based on the previous year's information. These imputed observations are used in the construction of the agglomeration variables and for measuring overall rates of entry and exit. The coefficients used to construct TFP were estimated excluding the imputed observations, but TFP was then estimated using all firms. All results were run with and without the imputed observations. Results are extremely robust to their inclusion or exclusion.

the threshold. Third, the data has information on different levels of geographic units. This allows one to test for the appropriate level of geographic aggregation in analyzing the effects of location.

The manufacturing firm survey covers a range of basic information on these firms such as sales, production, exports, investment, number of permanent and temporary workers, sector, year of establishment, legal status and location. There are 15 sectors corresponding to the ISIC 3.0 level.⁹

3.2 *Variables: Definition and Construction*

3.2.1 *Firm-Level Variables*

A number of firm characteristics are controlled for, include firm size (i.e. number of full-time employees), firm age, and legal status (e.g. sole proprietorship, corporation etc.). Additional firm-level variables are used in the firm exit analysis to control for the firm's estimate of its persistent profitability, described in Section 2. These include the share of casual workers in the firm;¹⁰ export propensity (defined as the percentage of sales exported); foreign ownership share (defined as the percentage of a firm's equity owned by foreigners); capital intensity (defined as the log of capital to workers)¹¹; and

⁹ "Food & Beverages"; "Tobacco"; "Textiles"; "Clothing"; "Leather & Shoes"; "Wood Products"; "Paper Products"; "Publishing & Printing"; "Coke, Refined Petroleum & Nuclear Fuels"; "Chemicals"; "Rubber & Plastics"; "Non-Metallic Mineral Products"; "Basic Metals"; "Fabricated Metal Products"; "Machinery & Equipment"; "Office, Accounting & Computing Machinery"; "Electrical Machinery & Apparatus"; "Radio, Television and Communication Equipment"; "Medical Instruments"; "Automobiles"; "Transport Materials"; and "Furniture".

¹⁰ The total workers figure is a summation of permanent and temporary workers. The temporary worker information is expressed in days worked per year. To transform this into a permanent employee equivalent, this figure is divided by 256, which allows for 52 weekends and 6 public holidays in a given year.

¹¹ Deflated net book value of total assets is used as the measure of capital. Capital estimates were only available for 2001 and had to be predicted for the other years. See Hallward-Driemeier et al. (2009) for further details.

firm productivity measures. The averages of these variables for the location-sector are used in the firm entry regressions.

A number of specifications were used in constructing the productivity estimates. Fixed effects regressions were used to capture unobserved heterogeneity, with Cobb-Douglas and translog specifications. The ones reported here are based on Arellano-Bond technique using lagged differences as instruments, and calculated sector by sector (see Hallward-Driemeier and Thompson (2009) for more details).¹² The results presented here are robust to the different specifications.

Location (defined at either the provincial or commune level), sector and year dummy variables, as well as sector growth rate information is used in both the firm entry and exit regressions.

3.2.2 Agglomeration Variables

3.2.2.A *Scale, Specialization-Diversity and Competition Effects*

Agglomeration externalities refer loosely to the benefits that firms extract from the local industrial structure. The literature focuses on three dimensions of the local industrial structure: market size, the degree of industrial specialization or diversity, and competition. Scale is captured with two variables: total workers in the location-sector (L_{ist}) and total workers in the entire location (L_{it}). To capture the diversity effects, we construct a Herfindahl-Hirschman diversity index based on employment shares:

$$D_{it} = \frac{1}{\sum_{s \in it} \left(\frac{L_{ist}}{L_{it}} \right)^2} \quad (12)$$

¹² Further information on the productivity estimates can be found in Hallward-Driemeier et al. (2006).

Where, as before, subscripts n , i , s and t refer to firm, location (i.e. commune, city, province), sector and time. This variable is constructed such that increases in its value are reflective of greater local diversity. At the extreme, if total employment in a location (L_{it}) is distributed equally between all sectors, then the value of this variable is equal to the number of sectors in the location.

Localized competition is captured through two variables: an inverse Hirschman-Herfindahl Index (invHHI), and the number of firms in the location-sector. Like the scale and diversity variables, the competition variables are calculated using the responses in the same geographical unit of analysis (i.e. commune or province level).

To capture competition, we calculate the invHHI based on deflated firm revenues in the location-sector.

$$C_{ist}^2 = \log \left(\frac{1}{\sum_{n \in ist} \left(\frac{Q_{nt}}{Q_{ist}} \right)^2} \right) \quad (14)$$

This competition index variable is constructed such that higher values of the variable reflect higher levels of competition in that particular location-sector. If all firms are the same size, then the invHHI is simply equal to the reciprocal of the number of firms. As an alternative measure, we also include the number of firms in the location-sector.

$$C_{ist}^3 = N_{ist} \quad (15)$$

3.2.2.B *Relative Productivity Effects*

As explained in Section 2, apart from specialization, diversity and competition effects, the local economic environment can have a further influence on firm entry and exit

through relative productivity levels.¹³ It may be insufficient for a firm to simply be productive in order to decide to enter or remain in an industry; a firm may also need to be efficient *relative* to local competitors in order to survive in the marketplace. In order to measure this effect, we calculate a firm's distance to the local technology frontier as follows:¹⁴

$$\text{Distance to Frontier}_{n,ist} = \frac{\text{TFP}_{L,ist} - \text{TFP}_{n,ist}}{\text{TFP}_{L,ist}} \quad (10)$$

Where “ $\text{TFP}_{L,ist}$ ” is the total factor productivity for the leading firm in the location-sector for a given time period t . The values for this distance-to-frontier measure range between 0 (for the leading firm in the location-sector) and 1. In order to establish if these distance-to-frontier effects also operate at the national-sector level, the measure is also calculated for each sector. For the firm entry regressions, the distance-to-frontier measures are transformed to represent an average for all firms in the location-sector.

3.3 Descriptive Statistics

Some descriptive results for the variables included in the analysis are shown in Tables 1-3. The firm entry and exit rates for Moroccan firms during the sample period are shown in Table 1.¹⁵ There is an annual average exit rate of 5.1% and an entry rate of 8.3% during the sample period, which as discussed in Hallward-Driemeier et al. (2007), is slightly lower than that found in many other developing countries. The entry and exit rates seem to follow a consistent pattern to each other, which is somewhat surprising

¹³ Business environment constraints (e.g. corruption, infrastructure, regulation) may also vary regionally, but unfortunately such information is unavailable for the sample period used in this paper. Mengistae and Thompson (2006) explore the effect of sub-national variations in investment climate on firm productivity levels in Morocco from 2001-2003.

¹⁴ Similar measures have been used by Aghion et al. (2004) and Aghion et al. (2005).

¹⁵ The entry rate is defined as the number of plants observed in year t but not in year $t-1$, divided by the total number of plants in year $t-1$. The exit rate is similarly defined, representing the number of plants observed in year $t-1$ but not in year t , divided by the total number of plants in year $t-1$.

considering that economic cycles would a priori be expected to make them move in opposite directions (e.g. low entry and high exit during economic contractions). Haddad et al. (1996) also found no significant correlation between real output growth and firm turnover in Morocco from 1984-89.¹⁶

Table 2 presents a broader range of summary statistics. There are considerable size disparities amongst Moroccan firms. For example, the mean number of workers per firm is 71, yet the median is just 18. In terms of output, the median firm is less than one-tenth the size of the sample mean. Approximately 8% of workers in a given a firm are employed on a casual basis. The average age of firms in the census data is 15, with the oldest firm having been in operation for 102 years.¹⁷ Firm investment appears fairly sporadic, with the median firm in a given year investing nothing.

As discussed earlier in the paper, the agglomeration variables are available at two geographical levels – the commune and the province.¹⁸ Commune-level information is only available from 1998-2001 while province-level information for the entire sample period (i.e. 1985-2001).¹⁹

The average firm operates in a commune with over 20,000 (full-time equivalent) workers, climbing to almost 110,000 workers at the province level. Of these total workers, approximately 10% are within their own industry. The average firm has 49 other

¹⁶ Further discussion of trends in entry and exit rates during the period under examination can be found in Hallward-Driemeier et al. (2006a).

¹⁷ Age is measured at the time a firm begins its operations rather than the time the firm is legally established. Comparing the two sets of figures suggests that in some instances there is a sizeable lag between the legal establishment of firms and the commencement of operations.

¹⁸ Data is actually available at the city level, but with over 90 percent of firms in most provinces in the largest city, there was not enough variation to differentiate the results from those of provinces more generally.

¹⁹ The agglomeration variables were constructed using all observations, however the imputed observations are excluded from the final analysis due to the concerns of measurement error, and only the descriptive results for the non-imputed results are shown in Tables 1 and 2.

firms in its own sector at the commune level, rising to 212 at the province level. The greatest number of firms in any province during the period under examination is 696.

The competition $\ln HHI$ faced by the average firm is 9.65 at the commune level, rising to 27.1 at the province level. As mentioned earlier, higher values of this variable are reflective of greater levels of competition in the local area. Naturally, due to the increased geographical size of the provinces compared to the communes, competition is likely to be greater at the province level. Similarly, the diversity index increases as the geographical unit of observation increases.

Turning to the productivity variables, the distance-to-frontier is computed in three different ways. Firstly, it is computed at the national-sector level. Then it is computed at the province-sector and commune-sector levels. The variables will range between 0 and 1, with 0 indicating the firm is operating at the technology frontier. As the geographical unit becomes smaller (i.e. moving from the national to the commune level), the average distance to the technology frontier falls. However, in measuring distance as a share of range in the location, the reported measure of distance does not necessarily fall the geographic unit shrinks.

In Table 3, we compare the means of these variables across new entrants, surviving and exiting firms. There are several interesting results worth highlighting. Exiting firms have approximately half the number of workers of surviving firms, but still have slightly more workers than new entrants. The pattern is even sharper when looking at production. Despite having lower sales on average than exiting firms, new entrants have higher market shares than exiting firms at both sub-national levels (and even more than surviving firms at the commune levels). The size of the locations to which they

choose to locate also appears smaller than average. This implies that new entrants tend to locate in smaller regions where there is comparatively little competition and they thus represent a large share of the market.

Focusing on the productivity measures, we see that exiting firms appear to be less productive on average than surviving firms, but are still more productive than new entrants. Hahn (2000) found similar evidence for Korean firms. Despite this, Hallward-Driemeier et al. (2007) found the short-term effect of net entry to be positive on aggregate productivity growth in Morocco due primarily to the high productivity of a number of new entrants with large market shares. Consistent with the earlier analysis suggesting new entrants locate in regions with lower levels of competition, new entrants have a lower average distance-to-frontier at the city and commune levels (despite having lower productivity than exiting firms).

4. *Determinants of Firm Exit*

The firm exit results are shown for the province and commune results in Tables 4 and 5 respectively. The Cox proportional hazard model is used to estimate the effects of firm characteristics and agglomeration variables on the probability a firm will exit in a given year. The hazard ratios are reported in the tables.²⁰ A hazard ratio of 1 implies the variable has no effect on the probability of firm exit. Coefficients can be interpreted as

²⁰ There is some question where there are unobserved fixed effects at the firm level, such as manager quality, that should be controlled for. Attempts to use a panel logit with fixed effects would not converge. The linear fixed effects model was used and found very similar results to those reported here. While those estimates are not biased, they are not efficient and can perform poorly at the tails of the distribution. The predicted probabilities are also not restricted to be between 0 and 1; about 3 percent of the predicted probabilities were negative.

being multiplicative of the base probability of exit; a coefficient of 0.9 implies a 10 percent decline in the probability of exit.

4.1 Firm Exit (Province Level)

Focusing on the results at the province level (1985-2001) in Table 4, several firm characteristics are significant. Larger firms have a significantly lower probability of exiting. The casual worker share of firm employment, which has a positive and highly significant effect on firm exit in the cross-section does not have much explanatory power in the within estimation. Age enters significantly and non-linearly in the cross-section. Younger firms have higher probability of exit that then declines over time. The sector growth rates appear to reduce exit but not significantly.²¹ Capital intensity does too. Gebreeyesus (2005) also found capital intensity to have a negative effect on firm exit (but with mixed significance), while Harding, Soderbom and Teal (2006) and Shiferaw (2009) found it to be insignificant and Frazer (2005) found a positive effect for Ghanaian firms. In contrast, export propensity and public sector ownership are both predicted to increase the probability of firm exit. While the greater efficiency demands and constant change in export markets can likely explain the higher exit rates for exporting firms, the latter result for public ownership is somewhat puzzling. Similar results were found by Frazer (2005) for Ghanaian firms and Shiferaw (2009) for Ethiopian firms, and could possibly be explained by government restructuring and downsizing during the period of analysis. Foreign ownership has a positive effect on firm exit, but with mixed significance. Harding et al. (2006) found foreign ownership to be a significant determinant of firm exit

²¹ The significant result for the sector growth rate differs from the results of Haddad et al. (1996) for Morocco and also Roberts (1996) for Colombia. It is consistent, however, with Tybout (1996) who found sector growth to have a weak negative effect on firm exit, and Shiferaw (2005) who actually found sector growth to increase firm exit.

in their analysis of firms in Ghana, Kenya and Tanzania. Using Ethiopian data and a hazard function, Shiferaw (2009) found foreign ownership to have a negative effect on firm exit.

Firm size (measured as the log of firm employment) and dummy variables for whether the firm is a sole proprietorship or corporation are all significant. One possible interpretation is there proxy status for controlling for financial constraints in the firm exit decision. Consistent with the findings of Frazer (2005), Gebreeyesus (2005) and Harding et al. (2006) for other African countries, firm size is found to be negative and significant.²² However sole proprietorships (which are expected to be financially constrained) are surprisingly found to have a lower probability of exit than limited liability firms, while corporations are found to have a higher probability of exit.

Turning to the agglomeration variables, the paper finds that they are associated with higher rates of exit. Both total employment in an area and the share that is in one's sector are associated with increased probability of exit. Even industrial diversity is found to decrease firm exit, contrary to the hypothesis that the existence of multiple activities could lead to positive spillovers. What is striking is that these diversity and scale results are found even after controlling for productivity, which suggests that these agglomeration externalities operate through channels beyond productivity. Rather, this gives support to concerns of negative congestion externalities.

The competition indicators are significant too. Both the number of firms in the location-sector and the competition invHHI are above one and significant, reinforcing the importance of competition in determining survival. Haddad et al. (1996) found increases

²² The finding of the negative and significant influence of firm size on exit may not only reflect the influence of financial constraints. For example, larger firms may be better equipped to deal with macroeconomic fluctuations which may not be necessarily linked to financial resources.

in the competition invHHI to increase firm exit in their study of gross entry and exit rates from 1984-89 in Morocco. Similarly, Fafchamps (2004), using exit aggregated to the location-sector level, found the number of firms in the location-sector and the competition invHHI to both have negative and significant influences on firm exit. Looking at exit at the firm-level in this study rather than aggregated to the location-sector level as in these previous papers, reinforces the strength of this result.

Consistent with evidence from Frazer (2005) for Ghanaian firms and Gebreeyesus (2005) for Ethiopian firms, productivity is found to have a strong influence on the probability of firm survival.²³ This is true whether one uses the level of TFP or the ‘distance-to-frontier’ measure. Both the distance to the nation frontier and the provincial frontier were examined. The effect of the former is twice as high. This is consistent with competitive pressures acting on a larger scale than purely local interactions with neighboring firms. This pattern becomes even stronger as the geographic unit used for the agglomeration exercise is narrowed.

4.2 *Firm Exit (Commune Level)*

The commune-level results from 1998-2001 are shown in Table 5.²⁴ While the time dimension is much shorter, the benefit of the comparison is that we can test the significance of moving to much more narrowly defined geographic area.

²³ Harding et al. (2006) found productivity to only have a significant negative influence on firm exit when interacted with firm size.

²⁴ We also have information at the city level. However, with the vast majority of provinces having only one city, there were few differences between the province and city results.

The firm-level variables have similar effects to the province-level results.²⁵ Casual workers now enter more significantly; those with rising shares of casual workers being more vulnerable to exit. Capital intensity remains as a factor reducing exit.

The impact of total location employment and sector-location employment remain close to those at the provincial level. This implies congestion is at least not any stronger at the local level. For diversity, the effects are now much weaker. In fact, restricting the sample to firms without any imputed responses (col 11), the effect is actually reversed at the commune level (it was not at the provincial level), at the same time that the firm's own productivity effects are stronger. There is thus some weak evidence that local diversity may thus be more beneficial for more productive firms.

The results also reinforce the finding that competitive forces associated with pushing out inefficient firms do not have to be limited to your immediate neighborhood. The measures of productivity – including to the commune frontier and the national frontier – are significantly associated with survival. And these effects swamp the effects of scale and diversity.

Column 12 also tests whether the lagged rate of entry is associated with firm exit. It was not significant at the provincial level, but here greater rates of entry are associated with lower rates of exit. Rather than reinforcing the competition story, this would be consistent with higher growth or positive agglomeration effects as the number of firms in the location-sector would be rising over time. Indeed, the beneficial role of productivity in this specification is reduced almost by half. Below, when looking at firm entry, we will also test how it is affected by prior rates of firm exit.

²⁵ The public ownership variable had to be dropped as it predicted exit perfectly.

5. *Do the Determinants of Firm Exit Vary by Firm Types?*

Table 6 examines whether the factors affecting exit vary by type of firm. In the first column, three dummies are created for firm size (<10 as small, 10-49 as medium and >50 as large). There are some non-linear results with respect to diversity and competition. For diversity, the effect is still associated with higher rates of exit – but less so for larger firms, exporters, firms with foreign partners and corporations. For competition, the overall effect of increasing the probability of exit is mitigated for large firms and for exporters. Part of this could reflect larger firms being older and more established, often with better connections. Or it could reflect the importance of attaining economies of scale that many small firms fail to do. But the most striking results are related to the impact of productivity.

The effects of productivity gaps on increasing exit are found to be *higher* for *larger* firms. This is consistent with Harding et al.’s finding in Sub-Saharan Africa that small firm survival was driven by different dynamics than that of larger firms and that productivity was only significant for larger firms. The effect is mirrored for exporters and foreign owned firms, older firms and corporations. All but government owned firms where the effect is not significant. If smaller, younger, domestically oriented firms are less subject to competitive pressures, this implies a less efficient allocation of resources, and that firm dynamics are less likely to contribute to increases in aggregate productivity.²⁶

The results for age are striking. Young firms (<5 years) have significantly different responses on all but one interaction. They benefit in particular from higher

²⁶ We test this hypothesis in “The Productivity Effects of Firm Turnover in Moroccan Manufacturing” 2009.

sectoral growth (in fact they may have entered in response to this higher demand), although they benefit less from diversity measures. But they are less sensitive to either competition or relative productivity. This may reflect the fact that young firms are in their most dynamic stage; often entering with initial low productivity levels that can increase over time. Their initial measure of productivity may not be an accurate forecast of future productivity.

Exporters and FDI firms benefit more from sector growth. The only other difference is that they are particularly sensitive to relative productivity. Both types of firms are generally found to be more productive. But this finding reinforces that it is not just the absolute level that matters – particularly if firms need to meet international standards in a broader market, distances from the frontier are likely to be all the more damaging.

6. *Determinants of Firm Entry*

As it is not possible to have information about potential firms, it is not possible to conduct the analysis of entry in a symmetric way. Rather, entry is examined as averages at the location-sector-year level. Those firm-level measures are thus averaged by location-sector for the entry regressions. The dependent variable is the share of new entrants in $t+1$ relative to the total population in the local-sector at period t .

6.1 *Firm Entry (Province Level)*

The firm entry results at the province-level appear in Table 7. The only firm characteristic that is significant is public ownership, while foreign ownership share and

export propensity are insignificant.²⁷ After controlling for industry fixed effects, Haddad et al. (1996) also found average foreign ownership to have an insignificant influence on firm entry. Average capital intensity and sector output growth is found to have an insignificant effect on firm entry.

The location-scale effect is no longer significant. Firms are not attracted to areas with a large amount of existing activity, and are actively discouraged from areas with high concentration in the sector. This reinforces the finding above that the agglomerating effects appear to be more negative than positive. Diversity, on the other hand, has little impact. However, the competition effect is large, negative and significant. Thus competition serves to increase exit, but what is somewhat surprising is that entry rates are lower where competition is fiercer (i.e. where market share concentration is lower). This could be due to a congestion effect. However, together, these effects over time will serve to decrease the concentration of firms in the location-sector, thereby serving to erode the effect.

Interestingly, the effect of productivity is not significant at the province level. Either the geographic unit is too large to capture the potential positive spillovers of having productive neighbors. Or, that would indicate that firms prefer to enter locations with generally less efficient firms and where there is no one firm clearly outperforming the rest so that they will be better able to compete. The comparison with the commune level data should be instructive.

²⁷ All the firm characteristic results are not presented due to space constraints. The full tables are available on request.

One last result, in col. 10 is that including the prior rate of firm exit raises the attraction of an area for new firms, while also making the effect of having unproductive neighbors more discouraging. If an area is more dynamic, productivity can matter more.

6.2 Firm Entry (Commune Level)

There is a striking difference when one compares the province results with those from the commune level (table 8). Now, the average productivity of the location-sector is positive in attracting entry – and that larger distance to the frontier discourages entry. The coefficients are large. This implies that the benefit of agglomeration or being located near productive neighbors is a localized effect. The results on competition remain large and negative. Thus the interpretation needs refining. Firms still are wary of entering locations with high competition and competition is less restricted by geographic boundaries. However, there is clearly an attraction of locating next to more productive firms. That the benefits are more localized is consistent with the traditional explanations of the desire to copy and learn from other firms in similar businesses, the sharing of ideas and networks that improve efficiency, or the presence of more skilled or high quality input markets in the location, all effects that are more likely to operate within narrower geographic units.

7. Conclusion

The recent increase in interest in the effects of firm turnover on overall economic performance has provided the stimulus for explorations of the determinants of firm entry and exit. Overall, the results confirm the most significant role in firm turnover is played by productivity. This is true not only improving the probability of survival of incumbent

firms, but also in attracting new firms to specific locations. Local scale effects and competition are significant, raising the probability of exit, while discouraging entry, although the effects are smaller. Sectoral diversity in a location is not as robust – and is even associated with increasing exit.

Three additional methodological insights emerge that should influence future research in this area. First, agglomeration externalities appear to influence firm turnover beyond productivity channels. Thus studies of firm analysis should take these agglomerating into account too; a firm's own productivity is not sufficient in explaining the patterns.

Second, both absolute and relative productivity are important influences on firm turnover. For example, while the negative impact of productivity on firm exit found in other empirical studies is confirmed for Moroccan firms, relative efficiency is also found to be important. More specifically, it was found that at both province and commune level, it is insufficient for firms to be productive to avoid exit, firms must also keep pace with the productivity of the leading firms in their sector. Relative efficiency also appears to matter for firm entry with firms attracted to regions with low productivity and low productivity gaps in the local region.

Third, the unit of geography used also matters. For exit, the effects do not vary so much by whether one looks at effects at the province or commune level. However, for entry it makes a difference. While competition is less localized, the benefit of having productive neighbors is stronger with smaller geographic units.

References

- Aghion, P. ; Burgess, R.; Redding, S. and Zilibotti, F. .** "The Unequal Effects of Liberalization: Theory and Evidence from India," London School of Economics Working Paper, 2004.
- Aghion, P. and Howitt, P.** "Growth with Quality-Improving Innovations: An Integrated Framework," P. Aghion and S. Durlauf, *Handbook of Economic Growth*. Amsterdam: New Holland, 2005,
- Bartelsman, E.; Haltiwanger, J. and Scarpetta, S.** "Microeconomic Evidence of Creative Destruction in Industrial and Developing Countries." IZA Working Paper 1374, 2004.
- Bigsten, A. and Soderbom, M.** "What Have We Learnt from a Decade of Manufacturing Enterprise Surveys in Africa?," World Bank Research Working Paper, 2005.
- Bun, M. and El Makhoulfi, A.** "Dynamic Externalities, Local Industrial Structure and Economic Development: Panel Data Evidence for Morocco," University of Amsterdam Faculty of Economics and Econometrics Working Paper, 2004.
- Ciccone, A. and Matsuyama, K.** "Start-up Costs and Pecuniary Externalities as Barriers to Economic Development." *Journal of Development Economics*, 1996, 49, pp. 33-59.
- Clerides, S.; Lach, S. and Tybout, J.** "Is Learning-by-Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco." *Quarterly Journal of Economics*, 1998, 113(3), pp. 903-47.
- Combes, P.** "Economic Structure and Local Growth: France 1984-1993." *Journal of Urban Economics*, 2000, 47, pp. 329-55.
- Fafchamps, M.** "Manufacturing Growth and Agglomeration Effects," Centre for the Study of African Economies (CSAE) Working Paper, Oxford University, 2004.
- Fafchamps, M. and El Hamine, S.** "Firm Productivity, Wages, and Agglomeration Externalities," Centre for the Study of African Economies Working Paper, 2004.
- Fafchamps, M.; El Hamine, S. and Zeufack, A.** "Learning to Export: Evidence from Moroccan Manufacturing," World Bank Policy Research Working Paper, 2002.
- Frazer, G.** "Which Firms Die? A Look at Manufacturing Firm Exit in Ghana." *Economic Development and Cultural Change*, 2005, 53(3), pp. 585-618.
- Fujita, M.; Krugman, P. and Venables, A.J.** *The Spatial Economy: Cities, Regions and International Trade*. Cambridge: MIT Press, 1999.

Gebreeyesus, M. "Firm Turnover and Productivity Differentials in Ethiopian Manufacturing," *Journal of Productivity Analysis*, 2005, 29, pp. 113-29.

Glaeser, E.; Kallal, H.; Sheinkman, J. and Shleifer, A. "Growth in Cities", *Journal of Political Economy*. 100(6), pp. 1126-52.

Haddad, M. "How Trade Liberalization Affected Productivity in Morocco," World Bank Policy Research Working Paper, 1993.

Haddad, M.; de Melo, J. and Horton, B. "Morocco, 1984-89: Trade Liberalization, Exports, and Industrial Performance," M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure*. Oxford: Oxford University Press, 1996,

Haddad, M. and Harrison, A. "Are There Dynamic Externalities from Direct Foreign Investment: Evidence for Morocco." *Journal of Development Economics*, 1993, 42, pp. 51-74.

Hahn, C.-H. "Entry, Exit, and Aggregate Productivity Growth: Micro Evidence on Korean Manufacturing," OECD Economics Department Working Paper 2000.

Hallward-Driemeier, M. "Who Survives? The Impact of Corruption, Competition and Property Rights Across Firms." World Bank Working Paper 5084, 2009.

Hallward-Driemeier, M. and Thompson, F. "Creative Destruction and Policy Reforms: Changing Productivity Effects of Firm Turnover in Moroccan Manufacturing, World Bank Working Paper 5085, 2009.

Hamilton, J.; Thisse, J.-F. and Zenou, Y. . "Wage Competition with Heterogeneous Workers and Firms." *Journal of Labor Economics*, 2000, 18, pp. 453-72.

Harding, A.; Soderbom, M. and Teal, F. "The Determinants of Survival among African Manufacturing Firms." *Economic Development and Cultural Change*, 2006, 54(3), pp. 533-55.

Harrison, A. "Determinants and Effects of Direct Foreign Investment in Cote D'ivoire, Morocco, and Venezuela," M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure*. Oxford: Oxford University Press, 1996, 163-86.

Henderson, V. "Externalities and Industrial Development," *Journal of Urban Economics*, 1997, 42, pp. 449-70.

Hopehayn, H. "Entry, Exit and Firm Dynamics in Long Run Equilibrium', *Econometrica*." *Econometrica*, 1992, 60(3), pp. 1127-50.

- Jacobs, J.** *The Economy of Cities*. New York: Vintage, 1969.
- Jovanovic, B.** "Selection and the Evolution of Industry." *Econometrica*, 1982, 50(3), pp. 649-70.
- Mengistae, T. and Thompson, F.** "Unbundling Location Effects in Productivity: The Case of Manufacturing Plants in Morocco," World Bank Working Paper, 2006.
- Nickell, S.** "Product Markets and Labour Markets." *Labor Economics*, 1999, 6, pp. 1-20.
- Roberts, M.** "Colombia, 1977-85: Producer Turnover, Margins, and Trade Exposure," M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure*. Oxford: Oxford University Press, 1996,
- Rodriguez-Clare, A.** "The Division of Labor and Economic Development." *Journal of Development Economics*, 1996, 49, pp. 3-32.
- Rosenthal, S. and Strange, W.** "Evidence on the Nature and Sources of Agglomeration Externalities," J. V. Henderson and J.-F. Thisse, *Handbook of Urban and Regional Economics*. New York: New Holland, 2004,
- Salop, S.** "Monopolistic Competition with Outside Goods." *Bell Journal of Economics*, 1979, 10(1), pp. 141-56.
- Shiferaw, A.** "Survival of Private Sector Manufacturing Establishments in Africa: The Role of Productivity and Ownership. *World Development*, 2009, 37(3), pp. 572-584.
- Tybout, J.** "Chile, 1979-86: Trade Liberalization and Its Aftermath," M. Roberts and J. Tybout, *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity, and Market Structure*. Oxford: Oxford University Press, 1996,

Table 1: Entry and Exit Rates (1986-2001)

	Entry Rate	Exit Rate
1985		4.56%
1986	12.13%	4.04%
1987	9.79%	3.80%
1988	8.26%	3.37%
1989	9.32%	2.61%
1990	8.13%	3.81%
1991	8.83%	6.15%
1992	8.55%	5.76%
1993	7.79%	3.65%
1994	5.06%	6.71%
1995	8.37%	6.44%
1996	8.16%	3.86%
1997	7.45%	7.48%
1998	10.03%	4.18%
1999	6.70%	8.56%
2000	12.46%	6.83%
2001	7.19%	6.52%
2002	7.51%	6.07%
2003	8.63%	

These exclude re-entry episodes of firms.

Table 2: Descriptive Statistics

Firm-Level Variables (1985-2001)	Obs	Mean	Median	Std.Dev.	Min	Max
Annual Production	99308	7444	605	86941	1	8011912
Annual Investment	79712	524	11	4523	0	431636
Public Equity Share of Total Equity	99308	1%	0%	8%	0%	100%
Foreign Equity Share of Total Equity	99308	10%	0%	27%	0%	100%
Export Share of Total Sales	99308	18%	0%	36%	0%	100%
Total Workers	99308	71	18	205	1	8011
Casual Worker Share (%)	99308	0.1	0.0	0.3	0	49
Firm Age	99308	15.0	11.0	13.4	1	102
Net Book Value of Total Assets	95301	6,680	638	42,851	2	3,513,793
Agglomeration Variables	Obs	Mean	Median	Std.Dev.	Min	Max
Province Level (1985-2001)						
Sectoral Employment in Location	99308	17,294	6,266	19,526	1	70,597
Total Employment in Location	99308	98,968	24,937	99,573	1	231,068
Diversity Index	99308	4.23	4.67	1.36	1.00	6.18
Firm Market Share (nat'l)	99308	0.12%	0.01%	0.74%	0.00%	51.91%
Firm Market Share (prov)	99308	4.22%	0.20%	14.00%	0.00%	100.00%
Competition HHI	99308	27.11	10.96	33.78	1.00	129.72
Number of Firms in location-sector	99308	213	89	217	1	696
Commune Level (1988-2001)						
Sectoral Employment in Location	28015	4,403	928	7,233	1	34,906
Total Employment in Location	28015	21,567	7,631	29,651	1	110,367
Diversity Index	28015	3.30	3.26	1.30	1.00	5.98
Firm Market Share (comm)	28015	13.24%	1.22%	26.80%	0.00%	100.00%
Competition HHI	28015	9.65	5.04	11.35	1.00	53.77
Number of Firms in location-sector	28015	50	24	61	1	293
Productivity Variables	Obs	Mean	Median	Std.Dev.	Min	Max
TFP	95301	1.68	1.70	1.07	-4.71	6.40
Distance to Frontier (sector level)	95301	0.47	0.47	0.14	0.00	1.00
Distance to Frontier (province-sector level)	94573	0.49	0.48	0.23	0.00	1.00
Distance to Frontier (commune-sector level)	26594	0.50	0.51	0.29	0.00	1.00

Table 3: Comparison of Means

Comparison of Means	New Entrants	Surviving Incumbents	Exiting Firms
Observations (1985-2001)	8,263	86,211	5,336
Firm-Level Variables (1985-2001)			
Annual Production	1549	8301	2456
Annual Investment	540	543	201
Public Equity Share of Total Equity	0%	0	0
Foreign Equity Share of Total Equity	11%	0	0
Export Share of Total Sales	21%	0	0
Total Workers	35	76	45
Casual Worker Share (%)	0.1	0	0
Firm Age	4.1	16	14
Net Book Value of Total Assets	877	7495	2594
Agglomeration Variables			
Province Level (1985-2001)			
Sectoral Employment in Location	14,086	17,486	18,981
Total Employment in Location	75,475	100,908	101,943
Diversity Index	3.96	4	4
Firm Market Share (nat'l)	0.03%	0	0
Firm Market Share (prov)	3.94%	0	0
Competition HHI	24.80	27	30
Number of Firms in location-sector	176	215	227
Commune Level (1988-2001)			
Sectoral Employment in Location	2,977	4,470	5,481
Total Employment in Location	12,923	22,049	26,830
Diversity Index	2.99	3.33	3.34
Firm Market Share (comm)	15.55%	13.20%	10.59%
Competition HHI	7.51	9.78	10.90
Number of Firms in location-sector	35	51	59
Productivity Variables			
TFP	1.29	1.73	1.44
Distance to Frontier (sector level)	0.52	0.46	0.50
Distance to Frontier (province-sector level)	0.56	0.48	0.54
Distance to Frontier (commune-sector level)	0.57	0.49	0.54

Table 4: Firm Exit Regressions (Province Level) 1985-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Firm Controls											
Labor (log)	0.669*** (0.011)	0.671*** (0.011)	0.664*** (0.011)	0.671*** (0.011)	0.671*** (0.011)	0.670*** (0.011)	0.671*** (0.011)	0.666*** (0.011)	0.661*** (0.011)	0.622*** (0.013)	0.670*** (0.010)
Share of Casual Workers	1.036* (0.021)	1.043** (0.021)	1.042** (0.021)	1.042** (0.021)	1.040* (0.021)	1.041** (0.021)	1.043** (0.021)	1.050** (0.021)	1.035* (0.021)	1.031 (0.021)	1.054*** (0.021)
Firm Age (log)	4.635*** (0.233)	4.569*** (0.230)	4.543*** (0.229)	4.538*** (0.228)	4.564*** (0.230)	4.575*** (0.230)	4.522*** (0.228)	4.484*** (0.228)	4.544*** (0.229)	3.306*** (0.200)	1.164 (0.115)
Firm Age Squared (log)	0.761*** (0.009)	0.759*** (0.009)	0.760*** (0.009)	0.761*** (0.009)	0.762*** (0.009)	0.760*** (0.009)	0.762*** (0.009)	0.762*** (0.009)	0.761*** (0.009)	0.809*** (0.012)	0.971 (0.019)
Capital Intensity	0.792*** (0.014)	0.804*** (0.014)	0.807*** (0.014)	0.801*** (0.014)	0.809*** (0.014)	0.802*** (0.014)	0.807*** (0.014)	0.796*** (0.014)	0.777*** (0.014)	0.780*** (0.017)	0.831*** (0.016)
Agglomeration Externalities											
Total Employment in Location (log)		1.067*** (0.008)									
Sectoral Employment in Location (log)			1.080*** (0.008)								
Diversity Index				1.414*** (0.058)			1.342*** (0.062)	1.295*** (0.060)	1.313*** (0.060)	1.260*** (0.072)	1.086* (0.052)
Competition (inverse HHI)					1.076*** (0.013)		1.031** (0.014)	1.044*** (0.014)	1.056*** (0.014)	1.055*** (0.017)	1.057*** (0.015)
Number of Firms in location-sector (log)						1.072*** (0.010)					
Productivity and Turnover											
Distance to National Sector Frontier	4.999*** (0.513)	5.127*** (0.528)	5.371*** (0.556)	5.339*** (0.551)	5.098*** (0.525)	5.249*** (0.542)	5.327*** (0.550)			6.177*** (0.778)	6.021*** (0.661)
Distance to Provincial Sector Frontier								2.545*** (0.167)			
TFP									0.775*** (0.011)		
New Entry Rate (lagged)											0.963 (0.061)
Observations	95296	95296	95296	95296	95296	95296	95296	94575	95296	78704	86190
Firms	12085	12085	12085	12085	12085	12085	12085	12025	12085	11719	11168
# Exits	5140	5140	5140	5140	5140	5140	5140	5113	5140	3527	4641
chi2	2480.713	2546.323	2581.365	2572.763	2537.888	2533.213	2584.667	2458.615	2654.787	1432.132	1150.905

Estimated using Cox Proportional Hazard Model, with multiple observations per firm. Hazard ratios are reported. Additional controls include export status, foreign ownership, government ownership, corporate status, and sector dummies. Robust standard errors in parentheses * significant at 10%; ** at 5%; *** at 1%.

Col. 10 restricts the sample to only those firms with no imputed values in any year.

Table 5: Firm Exit Regressions (Commune Level) 1998-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Firm Controls											
Labor (log)	0.687*** (0.017)	0.681*** (0.017)	0.672*** (0.017)	0.687*** (0.017)	0.686*** (0.017)	0.685*** (0.017)	0.686*** (0.017)	0.684*** (0.018)	0.678*** (0.017)	0.627*** (0.021)	0.687*** (0.017)
Share of Casual Workers	1.974*** (0.254)	2.223*** (0.292)	2.221*** (0.290)	2.033*** (0.265)	2.064*** (0.269)	2.113*** (0.277)	2.086*** (0.273)	2.131*** (0.290)	2.024*** (0.264)	2.035*** (0.369)	2.011*** (0.277)
Firm Age (log)	2.870*** (0.248)	2.793*** (0.243)	2.792*** (0.243)	2.862*** (0.248)	2.813*** (0.244)	2.816*** (0.244)	2.818*** (0.245)	2.844*** (0.257)	2.825*** (0.246)	1.559*** (0.161)	1.338* (0.227)
Firm Age Squared (log)	0.809*** (0.017)	0.808*** (0.017)	0.809*** (0.017)	0.808*** (0.017)	0.811*** (0.017)	0.809*** (0.017)	0.811*** (0.017)	0.806*** (0.018)	0.809*** (0.017)	0.909*** (0.023)	0.931** (0.032)
Capital Intensity	0.834*** (0.024)	0.845*** (0.024)	0.851*** (0.024)	0.838*** (0.024)	0.847*** (0.024)	0.846*** (0.024)	0.847*** (0.024)	0.844*** (0.025)	0.819*** (0.024)	0.833*** (0.031)	0.873*** (0.028)
Agglomeration Externalities											
Total Employment in Location (log)		1.069*** (0.014)									
Sectoral Employment in Location (log)			1.080*** (0.013)								
Diversity Index				1.107* (0.058)			1.051 (0.058)	1.084 (0.063)	1.056 (0.058)	0.848** (0.060)	1.068 (0.063)
Competition (inverse HHI)					1.072*** (0.025)		1.063** (0.026)	1.075*** (0.028)	1.080*** (0.027)	1.079** (0.035)	1.064** (0.027)
Number of Firms in location-sector (log)						1.075*** (0.019)					
Productivity and Turnover											
Distance to National Sector Frontier	3.046*** (0.520)	2.969*** (0.508)	3.102*** (0.532)	3.040*** (0.520)	3.031*** (0.519)	3.055*** (0.524)	3.032*** (0.519)			5.079*** (1.115)	2.740*** (0.502)
Distance to Provincial Sector Frontier								1.626*** (0.139)			
TFP									0.852*** (0.020)		
New Entry Rate (lagged)											0.813* (0.088)
Observations	28020	28015	28015	28015	28015	28015	28015	26594	28015	21195	25161
Firms	8738	8735	8735	8735	8735	8735	8735	8469	8735	7889	8058
# Exits	1830	1827	1827	1827	1827	1827	1827	1737	1827	1116	1676
chi2	612.223	638.854	662.54	613.26	626.023	630.878	626.146	568.147	629.005	497.231	385.436

Estimated using Cox Proportional Hazard Model, with multiple observations per firm. Hazard ratios are reported. Additional controls include export status, foreign ownership, government ownership, corporate status, and sector dummies. Robust standard errors in parentheses * significant at 10%; ** at 5%; *** at 1%.

Col. 10 restricts the sample to only those firms with no imputed values in any year.

Table 6: Firm Exit By Firm Types 1985-2001

Firm Characteristics:	(1) Size	(2) Young	(3) Export	(4) FDI	(5) Govt	(6) Corporation
Category 1:	<10	<5 yrs	<10% sales	<10% foreign	<10% Govt	No
Category 2:	10-49	5+ yrs	10%+ sales	10%+ foreign	10%+ Govt	Yes
Category 3:	50+					
Interaction by:						
Employment	0.631*** (0.017)	0.671*** (0.011)	0.666*** (0.011)	0.669*** (0.011)	0.671*** (0.011)	0.670*** (0.011)
LFirmAge	4.487*** (0.227)	6.106*** (0.398)	4.564*** (0.230)	4.545*** (0.229)	4.516*** (0.227)	4.444*** (0.224)
LFirmAge2	0.763*** (0.009)	0.733*** (0.010)	0.760*** (0.009)	0.761*** (0.009)	0.762*** (0.009)	0.764*** (0.009)
Exporter	1.715*** (0.080)	1.789*** (0.082)	1.851*** (0.196)	1.751*** (0.080)	1.786*** (0.081)	1.756*** (0.080)
FDI	1.216*** (0.063)	1.221*** (0.063)	1.202*** (0.063)	0.938 (0.104)	1.228*** (0.063)	1.232*** (0.064)
Govt	2.741*** (0.516)	2.915*** (0.543)	2.963*** (0.549)	2.958*** (0.557)	2.257 (1.242)	2.885*** (0.530)
Corporation	1.06 (0.045)	1.047 (0.044)	1.053 (0.044)	1.047 (0.044)	1.044 (0.044)	1.055 (0.044)
Diversity Index (log)	1.651*** (0.102)	1.292*** (0.068)	1.412*** (0.072)	1.372*** (0.067)	1.348*** (0.063)	1.588*** (0.095)
Div Ind×Categ 2	0.701*** (0.055)	1.135 (0.089)	0.770*** (0.066)	0.819** (0.077)	0.754 (0.286)	0.638*** (0.058)
Div Ind×Categ 3	0.633*** (0.060)					
Competition HHI (log)	1.047** (0.022)	1.038** (0.016)	1.051*** (0.016)	1.040*** (0.015)	1.031** (0.014)	1.044** (0.018)
CompHHI×Categ 2	1.017 (0.029)	0.984 (0.026)	0.953* (0.027)	0.966 (0.031)	1.086 (0.213)	0.994 (0.024)
CompHHI×Categ 3	0.947* (0.031)					
nDistancefafsec	2.452*** (0.328)	4.657*** (0.534)	4.241*** (0.479)	4.419*** (0.481)	5.302*** (0.548)	3.237*** (0.461)
nDistancefafsec×Categ 2	2.717*** (0.440)	1.657*** (0.260)	2.644*** (0.530)	3.476*** (0.711)	2.261 (2.173)	2.726*** (0.546)
nDistancefafsec×Categ 3	8.035*** (1.683)					
Observations	95296	95296	95296	95296	95296	95296
Firms	12085	12085	12085	12085	12085	12085
# Exits	5140	5140	5140	5140	5140	5140
chi2	2652.348	2472.052	2615.92	2610.958	2585.073	2645.795

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Estimated using Cox Proportional Hazard Model, with multiple observations per firm. Hazard ratios are reported.

Table 7: Firm Entry Regressions (Province Level) 1985-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Agglomeration Externalities										
Total Employment in Location (log)		0.004 (0.010)								
Sectoral Employment in Location (log)			-0.026*** (0.007)							
Diversity Index (log)				-0.009 (0.013)			0.004 (0.014)	-0.002 (0.013)	0.003 (0.014)	0.00 (0.013)
Competition HHI (log)					-0.061*** (0.009)		-0.061*** (0.008)	-0.049*** (0.007)	-0.061*** (0.008)	-0.068*** (0.008)
Number of Firms in location-sector (log)						-0.089*** (0.010)				
Productivity and Turnover										
Distance to National Sector Frontier	-0.065 (0.045)	-0.067 (0.045)	-0.047 (0.049)	-0.064 (0.045)	-0.07 (0.046)	-0.033 (0.047)	-0.07 (0.045)			-0.070* (0.042)
Distance to Provincial Sector Frontier								-0.035 (0.028)		
TFP									0.004 (0.008)	
Rate of exit										0.386*** (0.056)
Constant	0.243** (0.111)	0.111*** (0.042)	0.052 (0.086)	0.252*** (0.045)	0.119*** (0.044)	0.168*** (0.042)	0.254*** (0.044)	0.165*** (0.045)	0.128*** (0.039)	0.129*** (0.038)
Observations	3238	3968	3968	3968	3968	3968	3968	3968	3262	3968
Number of newcodee	304	304	262	304	304	304	304	304	304	304
R-squared	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.07

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Panel estimates on province-sector-year averages. Province, sector and year dummies are included.

Additional information on firm composition in province-sector-year cells were not significant, and so are not reported here.

Table 8: Firm Entry Regressions (Commune Level) 1998-2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Firm Controls										
Foreign Ownership (%)	-0.061 (0.059)	-0.065 (0.058)	-0.061 (0.057)	-0.062 (0.059)	-0.072 (0.057)	-0.081 (0.056)	-0.071 (0.057)	0.071 (0.075)	-0.072 (0.057)	-0.076 (0.057)
Public Ownership (%)	-0.004 (0.084)	0.022 (0.085)	0.069 (0.096)	-0.004 (0.084)	0.003 (0.079)	0.02 (0.078)	0.004 (0.080)	0.199* (0.119)	0.005 (0.079)	0.034 (0.081)
Export Propensity (%)	0.109** (0.054)	0.116** (0.054)	0.137** (0.054)	0.110** (0.054)	0.117** (0.053)	0.109** (0.052)	0.117** (0.053)	0.028 (0.052)	0.117** (0.053)	0.124** (0.053)
Capital Intensity	0.01 (0.012)	0.011 (0.012)	0.01 (0.012)	0.01 (0.012)	0.013 (0.012)	0.017 (0.012)	0.013 (0.012)	-0.003 (0.012)	0.013 (0.012)	0.014 (0.012)
Agglomeration Externalities										
Total Employment in Location (log)		-0.014*** (0.005)								
Sectoral Employment in Location (log)			-0.025*** (0.005)							
Diversity Index (log)				-0.011 (0.018)			0.013 (0.018)	0.014 (0.019)	0.013 (0.018)	0.013 (0.018)
Competition HHI (log)					-0.062*** (0.009)		-0.063*** (0.009)	-0.032*** (0.008)	-0.063*** (0.009)	-0.069*** (0.009)
Number of Firms in location-sector (log)						-0.062*** (0.008)				
Productivity and Turnover										
Distance to National Sector Frontier	-0.147** (0.073)	-0.140* (0.073)	-0.127* (0.073)	-0.146** (0.073)	-0.142** (0.072)	-0.130* (0.072)	-0.142** (0.072)			-0.142** (0.071)
Distance to Provincial Sector Frontier								-0.06 (0.039)		
TFP									0.020* (0.011)	
Rate of exit										0.171** (0.067)
Constant	0.103* (0.057)	0.177*** (0.061)	0.190*** (0.057)	0.111* (0.059)	0.125** (0.056)	0.136** (0.055)	0.116** (0.058)	0.131** (0.052)	0.017 (0.050)	0.113** (0.057)
Observations	3338	3338	3338	3338	3338	3338	3338	2178	3338	3338
Number of newcodee	304	304	262	304	304	304	304	304	304	304
R-squared	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.04	0.04	0.07

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Panel estimates on commune-sector-year averages. Commune, sector and year dummies are included.

Additional information on firm composition in commune-sector-year cells were not significant, and so are not reported here.